DOCUMENT RESUME

ED 410 429 CE 074 605

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TITLE Critical Linkages. Factors That May Influence Companies' Readiness To Implement Workplace Training.
INSTITUTION West Virginia Northern Community Coll., Wheeling.
PUB DATE 1996-04-00
NOTE 35p.
PUB TYPE Information Analyses (070) -- Tests/Questionnaires (160)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Adult Basic Education; Adult Literacy; Attitude Measures; *Early Intervention; *Education Work Relationship; *Educational Attitudes; *Employer Attitudes; Employment Practices; Influences; *Literacy Education; National Surveys; Organizational Change; Organizational Climate; School Business Relationship; Technological Advancement; *Workplace Literacy
IDENTIFIERS Employer Surveys

ABSTRACT

Factors affecting companies' readiness to implement workplace training were identified through a survey completed by 50 selected partner companies of the 44 National Workplace Literacy grantees during 1995-1996. Selection of the business partners to whom the survey was administered was left to the grantees' discretion. A 25-item questionnaire called the Critical Linkages survey was used to collect information regarding the following: companies' products and services; the time from businesses' first contact with the workplace literacy organization to the beginning of their first literacy training; and factors associated with the early implementation of workplace literacy programs. Of the companies surveyed, 67% began initial workplace literacy training within 10 months of their initial contact with a workplace literacy organization. The following factors were associated with earlier implementation of workplace literacy training: large company; increasing work force (in the case of product manufacturers but not service deliverers); recent increase or decrease in profits or level of service; restructuring and new technology; previous experience with workplace education programs; and company that values flexibility and worker autonomy. (Appended are the survey instrument, survey-related correspondence, a frequency distribution, and a data analysis.) (MN)

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# CRITICAL LINKAGES

## FACTORS THAT MAY INFLUENCE COMPANIES' READINESS TO IMPLEMENT WORKPLACE TRAINING

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**Elaine P. Johnson**
**West Virginia Northern Community College**
**April 1996**

WORKPLACE 2000

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# CRITICAL LINKAGES

## Factors That May Influence Companies' Readiness to Implement Workplace Training

Elaine P. Johnson
West Virginia Northern Community College

April 1996

## Abstract

Selected partner companies of the National Workplace Literacy grantees during 1995-1996 were surveyed in order to explore factors that may impact early implementation of training programs. Several variables were considered: type of company, size, structure, level of profits or services, restructuring, technology and organizational culture.

The following results might suggest characteristics to be explored as workplace literacy educators search for new partners to continue retraining the nation's workforce.

- Type: Service delivery companies implement sooner than product manufacturers.
- Size: Large companies begin training sooner than small companies.
- Type: Service delivery companies have larger numbers of part-time staff.
- Structure: Among early implementers, product manufacturers tend to have more managerial levels than service deliverers.
- Workforce: Product manufacturers are planning to hire more workers than service deliverers. About one-quarter of all companies are planning to hire next year.

More early implementers are planning to downsize, but most of the downsizing is being planned by service delivery companies.

The majority of all companies anticipate a stable workforce.

- Profits or level of services: When profits are

increasing, manufacturers tend to begin training sooner. When profits are decreasing or staying the same, there seems to be less incentive to begin programs at an early date.

- Restructuring: The majority of companies have restructured or are planning to restructure within the next year.

- Technology: The majority of companies have introduced new technology or are planning to do so within the next year.

- Previous experience: Early implementers were three times more likely to have had experience with workplace training than later implementers. More service deliverers had been involved in workplace training than product manufacturers.

# CRITICAL LINKAGES: FACTORS THAT MAY INFLUENCE COMPANIES' READINESS TO IMPLEMENT WORKPLACE TRAINING

by Elaine P. Johnson

April, 1996

## I. Introduction

During the administration and implementation of our Workplace Literacy Project, our primary barrier to carrying out the goals of the project has been the difficulty of gaining access to the businesses and industries with whom we are partnered. Of the four partner companies who signed a partnership agreement with us, one has declined all our efforts to establish a training program on site. Another had declined for most of the start-up year, but now, after several months, is working with us cooperatively to establish a training program on an ASAP basis. A third company has cooperated in an ongoing fashion; however, the willingness to make a commitment to classes did not occur until after several months of needs assessments and meetings. The fourth company has such complex bureaucratic protocols that meetings take weeks, and sometimes months, of negotiation with various company officials before they take place. Consequently, all early momentum is lost, and the process seems to need a new beginning each time.

What motivates businesses and companies to allow a workplace literacy program on site? Is there a "critical mass" of events that needs to occur before businesses allow initiation of an education and training process? Is size of the company a significant factor? Do multiple layers of bureaucracy help or hinder the process? Who makes the decision that workplace literacy programs can operate in the business environment? What forces impact this decision? What are the critical linkages that need to exist in a workplace literacy partnership for the program to be initiated?

## II. Review of Related Literature

The literature contains a myriad of articles and studies about how educational and training institutions should prepare themselves for working with business and industry, but little in the area of determining when the business or industry itself is ready for a training effort. In a recent posting on one of the National Institute for Literacy's list serves, Paul Jurmo (WEC list moderator) asked what was needed for a company/union to invest in workplace education. He reported that another colleague wanted to know what factors are in place in companies/unions which motivate them to invest in workplace education. Although these questions were asked within the framework of long-term planning by education agencies who expect their federal funds to run out, the questions, as well as the speculative answers, had implications for the purpose of the research.

Jurmo suggested that many factors influence companies to pursue workplace basic education including:

- the readiness of providers to provide high quality services
- prior positive experience with basic education efforts
- a commitment to creating a new way of doing work that implied an attention to the basic skills of workers
- a union-management contract that supports basic education
- creative decision-makers at all levels of the organization
- generating enough income to allow attention to education projects

In a response to Jurmo's list, Bob Knower (New York State Education Department) reported on an evaluation he had completed of a workplace literacy project in which he found

- the educational institution provided a high quality product
- the organization had been part of a pilot project
- the primary reason for training was restructuring.

In solicited comments from other project directors, several suggested that cultural factors may impact the readiness for participation in workplace literacy training projects.

Askov and others suggested that workplace literacy providers should study (among other factors) the organizational climate of companies "to identify the potential supports and obstacles to the development of workplace literacy interventions." (Askov, 1989, p. 37)

Meyer (1995) in his study of cultural values within an organization noted that "By understanding key values in the

organization, one can gain insight into basic characteristics of its culture...." (p. 217) Values tend to "encapsulate reality" and suggest "norms operative for that reality." (p. 219)

## III. Methodology

### A. Data

The data were collected from selected partner companies of the forty-four(44) National Workplace Literacy grantees during 1995-1996. They were collected between the end of January and the middle of March 1996. The method of data collection was the Critical Linkages survey.

Each project director was sent an initial letter describing the research and soliciting his or her cooperation. About two weeks later, each was sent the survey with the cover letter (Appendix A). Beginning the first week of March, selected project directors were asked to arrange an appointment with a business partner representative for a short (10-15 minute) interview with the researcher.

The project director or his or her representative was free to determine how to distribute the survey. Those grantees who had a large number of business partners were allowed to choose the number that would be asked to respond. Some directors sent the surveys to their business partners and asked the partners to return them to the researcher: others requested that the partners return the surveys to the directors and then forwarded them to the researcher. All in all, the directors had a great deal of discretion in how many and which of the business partners were given the survey and whether there were any controls as to their return.

Our office received fifty(50)completed surveys in what was considered to be a volunteer sampling.

### B. Description of factors

#### 1. Early implementation

The purpose of the research was to attempt to identify the factors that were associated with the early implementation of workplace literacy programs. To that end, we chose to measure the time it took from the first contact that the business had with the workplace literacy organization to the time of the beginning of the first training. This time period was measured in months.

## 2. Contributing factors

Some of the factors that we thought might affect early implementation of workplace literacy programs were type of business (product or service oriented), size of company, structure of company, recent changes in profit levels or level of services provided, recent or planned restructuring, recent or planned introduction of new technology, previous association with similar training programs and judgment of their effectiveness, and organizational cultural climate.

The survey first asked whether the company delivers services to customers or produces a product for use.

Size of the company was determined by asking for the approximate number of full-time and part-time workers.

Structure was operationalized by the number of managerial levels that existed between the training decision-maker and the chief executive officer.

Level of profits or level of services provided was measured by asking whether profits or services went up, down, or stayed the same during the past year.

Restructuring was measured at two levels: whether restructuring had already occurred (yes/no) or whether it was planned (yes/no).

New technology was measured at the same two levels: whether new technology had recently been introduced (yes/no) or whether it was planned (yes/no).

We also collected data on whether or not the company had engaged in similar training activities in the past, and whether it had been satisfied with those activities.

In order to identify prevailing cultural values, we used Meyer's Summary of Narrative Values that he used in his 1995 study.

- Consideration: people should show concern for others' needs and feelings.
- Organization/Planning: people should plan for work and activities in advance
- Timely Information: people should communicate information as quickly or as appropriately as possible.
- Participation in Decision-Making: there should be opportunities to influence events and help make decisions.

- Discussion of Conflict: conflict should be handled by talk among the persons involved.
- Friendliness: people should be personable and easy to get along with.
- Clarity of Messages: messages should be sent clearly and repeated to ensure accuracy.
- Commitment: people should derive intrinsic rewards from their work; doing more than may be expected for their jobs.
- Autonomy: people should be given flexibility and independence on the job.
- Authority: people should respect and follow directives of those above them in the decision hierarchy.

## IV. Data Analysis

The intent of the research was to discover factors that may have been different between two hypothetical populations: those companies that implemented training early and those companies that implemented training later. Based on the histogram in Appendix B, page 1, in which 67% of the early implementers began initial training before 10 months, the early implementers were defined as those who began training within that time period. The later implementers were defined as those who began training at ten (10) months or later. (Some responders did not answer all items.)

Early implementers = 34
Later implementers = 16

**SIZE OF WORKFORCE**

| | Early Group | Later Group |
|---|---|---|
| Average size of full-time workforce | 1458 | 712 |
| Average size of part-time workforce | 234 | 139 |
| Average number of managerial levels from training decision-maker to CEO. | 1.3<br>Reports directly to CEO or only one level below. | 1.2<br>Reports directly to CEO or only one level below. |

**CHANGE IN WORKFORCE**

| | Early Group | Later Group |
|---|---|---|
| Workforce has increased during the last year | 8 (24.2%) | 4 (26.6%) |
| Workforce has decreased during the last year | 4 (12.1%) | 1 (6.6%) |
| Workforce has stayed the same during the last year | 21 (63.6%) | 10 (66.6%) |

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## PROFIT OR SERVICE DELIVERY LEVELS

| | Early Group | Later Group |
|---|---|---|
| Profits/services have increased | 18 (58.0%) | 8 (53.3%) |
| Profits/services have decreased | 1 (3.2%) | 2 (13.3%) |
| Profits/services have stayed the same | 12 (38.7%) | 5 (33.3%) |

## RESTRUCTURING

| | Early Group | Later Group |
|---|---|---|
| Has restructured within the last year | 14 (55.8%) | 10 (62.5%) |
| Will restructure within the next year | 22 (64.7%) | 9 (60.0%) |

## NEW TECHNOLOGY

| | Early Group | Later Group |
|---|---|---|
| Has introduced new technology within the last year | 24 (70.5%) | 13 (93.7%) |
| Will introduce new technology within the next year | 24 (70.5%) | 14 (87.5%) |

## PREVIOUS EXPERIENCE

| | Early Group | Later Group |
|---|---|---|
| Had previous experience with workplace training | 12 (35.2%) | 2 (12.5%) |
| Level of satisfaction | Positive: 6 (50.0%)<br>Negative: 2 (16.6%)<br>Neither: 3 (25.0%) | Positive: 2 (100.0%) |

Upon reviewing the data, we noticed some consistent differences between product manufacturing companies and service delivery companies. In order to determine whether we were working with the same or different populations, we conducted several

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statistical procedures. We performed separate descriptive analyses of the difference in time (months) between initial contact and initial training implementation of the two groups (product and service). A one-way Analysis of Variance (ANOVA) and a two-sample test of independent raw data showed the probability of both sets of means coming from the same population was significant. (The ANOVA detects evidence of differences between means.) We tested the null hypothesis that the populations have the same averages using the Kruskal Wallis procedure which detects differences among ordinal variables. We used a nonparametric procedure to test the null hypothesis for similarity of medians. All showed that the two populations were distinct. (See Appendix B, pages 4-8)

As a result, we performed an analysis that might indicate whether or not there were differences or similarities among product/services companies and early/later implementation.

**Total Number**

**Early product implementers = 20** — **40% of all companies; 58.8% of all product companies**

**Early service implementers = 14** — **28% of all companies; 87.5% of all service companies**

**Later product implementers = 14** — **28% of all companies; 41.1% of all product companies**

**Later service implementers = 2** — **4% of all companies; 12.5% of all service companies**

| AVERAGE SIZE OF FULL-TIME WORKFORCE | | |
|---|---|---|
| | Product | Service |
| Early | 1471 | 1440 |
| Later | 699 | 800 |

| AVERAGE SIZE OF PART-TIME WORKFORCE | | |
|---|---|---|
| | Product | Service |
| Early | 15 | 547 |
| Later | 73 | 600 |

| AVERAGE NUMBER OF MANAGERIAL LEVELS FROM TRAINING DECISION-MAKER TO CHIEF EXECUTIVE OFFICER | | |
|---|---|---|
| | Product | Service |
| Early | 1.9 | .71 |
| Later | .92 | 2.5 |

| WORKFORCE HAS INCREASED THE PREVIOUS YEAR | | |
|---|---|---|
| | Product | Service |
| Early | 6 (30% of all early/product companies) | 2 (14.2% of all early/service companies) |
| Later | 4 (28.5% of all later/product companies) | 0 |

| WORKFORCE HAS DECREASED THE PREVIOUS YEAR | | |
|---|---|---|
| | Product | Service |
| Early | 1 (5% of all early/product companies) | 3 (21.4% of all early/service companies) |
| Later | 0 | 1 (50.0% of all later/service companies) |

| WORKFORCE HAS STAYED THE SAME THE PREVIOUS YEAR | | |
|---|---|---|
| | Product | Service |
| Early | 13 (65% of all early/product companies) | 8 (57.1%of all early/service companies) |
| Later | 10 (71.4% of all later/product companies) | 0 |

| PROFITS OR LEVEL OF SERVICES HAS INCREASED LAST YEAR | | |
|---|---|---|
| | Product | Service |
| Early | 12 (60.0% of all early/product companies) | 6 (42.8% of all early/service companies) |
| Later | 6 (42.8% of all later/product companies) | 2 (100% of all later/service companies) |

| PROFITS OR LEVEL OF SERVICES HAS DECREASED LAST YEAR | | |
|---|---|---|
| | Product | Service |
| Early | 1 (5% of all early/product companies) | 0 |
| Later | 2 (14.2% of all later/product companies) | 0 |

| PROFITS OR LEVEL OF SERVICES HAS STAYED THE SAME | | |
|---|---|---|
| | Product | Service |
| Early | 5 (25% of all early/product companies) | 7 (50.0% of all early/service companies) |
| Later | 5 (35.7% of all later/product companies) | 0 |

| COMPANY HAS RESTRUCTURED WITHIN THE LAST YEAR | | |
|---|---|---|
| | Product | Service |
| Early | 10 (50% of all early/product companies) | 9 (64.2% of all early/service companies) |
| Later | 8 (57.1% of all later/product companies) | 2 (100% of all later/service companies |

| COMPANY WILL RESTRUCTURE WITHIN THE NEXT YEAR | | |
|---|---|---|
| | Product | Service |
| Early | 14 (70.0% of all early/product companies) | 8 (57.1% of all early/service companies) |
| Later | 7 (50.0% of all later/product companies) | 2 (100% of all later/service companies) |

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| COMPANY HAS INTRODUCED NEW TECHNOLOGY WITHIN THE LAST YEAR | | |
|---|---|---|
| | Product | Service |
| Early | 17 (85.0% of all early/product companies) | 7 (50% of all early/service companies) |
| Later | 13 (92.8% of all later/product companies) | 2 (100% of all later/service companies) |

| COMPANY WILL INTRODUCE NEW TECHNOLOGY WITHIN THE NEXT YEAR | | |
|---|---|---|
| | Product | Service |
| Early | 17 (85.0% of all early/product companies) | 7 (50.0% of all early/service companies) |
| Later | 12 (85.7% of all later/product companies) | 2 (100% of all later/service companies) |

| COMPANY HAD PREVIOUS EXPERIENCE WITH WORKPLACE TRAINING | | |
|---|---|---|
| | Product | Service |
| Early | 5 (25% of all early/product companies) | 7 (50% of all early/service companies) |
| Later | 2 (14.2f% of all later/product companies | 0 |

## V. Discussion

We must be cautious in interpreting the results of this study because of the voluntary nature of the sampling and the relatively small numbers. In addition, the factors have only been broadly operationalized. However, within the context of an exploratory study, some of the data may be useful to Workplace Literacy Projects in identifying potential clients as well as providing new avenues for more rigorous research.

Size: The size of the company seems to be related to the shorter time of implementation. In both the first and second analysis, the larger the company, the more likely it was to be ready to begin workforce training. It may be that large companies are more likely to have the resources available to support training as well as larger, well-established Human Resources departments which are ready to utilize the educational resources that are available.

If number of both full-time and part-time workers is considered to be an indication of the size of a company, then workplace literacy trainers may find a more enhanced market in larger companies, both product- and service-oriented.

Change in Workforce: In the first analysis, it seemed likely that companies whose workforce was changing rapidly (increasing or decreasing) were better candidates for training. However, in the second analysis, product and service groups showed some difference. Product manufacturers seemed more likely to implement training early if their workforce were increasing, while service deliverers seemed to prefer a more stable climate in which to begin training their workers. Both groups have lower participation levels in a decreasing workforce environment.

Structure: All organizations seem to have training decision-making close to the head of the organization. Product manufacturers may have a more complex managerial structure in that the training decision-maker is further away bureaucratically from the CEO. In service delivery companies, the training decision-maker is usually very close to the CEO or is the CEO him- or herself. It might be useful to pursue the notion that the closer the training decision-maker is to the CEO, the more likely training will begin quickly since service delivery companies generally implement training sooner than product manufacturers.

Recent increase or decrease in profits or level of services: If either a product manufacturer's or service deliverer's profits or level of services has increased recently, the likelihood is that they are ready for training. If profits or services have decreased, it may be a hard sell for workplace trainers. If profits have stayed the same for a manufacturer, there may be an opportunity to provide training; it may be less likely with service deliverers whose level of services has remained the same. According to our sample, none is represented among our current partners.

Restructuring and New Technology: All groups of partners have a high interest in both of these areas. There may be a slight tendency for manufacturers to be involved at a higher rate than service deliverers. However, these do not seem to be major factors in attracting training opportunities.

Previous Experience: All service delivery early implementers had experience with workplace education programs. Within the product manufacturers, early implementers were twice as likely to have had experience than later implementers. Old customers seem to be the best customers as far as training opportunities are concerned.

Organizational Values: Among early implementers, autonomy of workers is a clear first choice no matter what the company's orientation is. Not surprisingly, service deliverers place more emphasis on friendliness and clear message sending (a social skill), while manufacturers value commitment and worker ability to make decisions. The kind of company that values flexibility and independence of its staff may be a good candidate for training if the educational organization can address the needs of business people to develop the autonomous workers that it values. (Please see chart on following page.)

## THE THREE TOP ORGANIZATIONAL VALUES RANKED BY VARIOUS GROUPS

**Description of organizational values**

**Autonomy**

People should be given flexibility and independence on the job.

**Clarity of Messages**

Messages should be sent clearly and repeated to ensure accuracy

**Commitment**

People should derive intrinsic rewards from their work; doing more than may be expected for their jobs; they should work at more than a minimal level.

**Communication**

People should communicate information as quickly or as appropriately as possible.

**Friendliness**

People should be personable and easy to get along with.

**Participation in Decision-Making**

There should be opportunities for people to influence events and help make decisions.

| Early implementation product companies | Early implementation service companies | Later implementation product companies | Later implementation service companies |
|---|---|---|---|
| 1. Autonomy<br>2. Commitment<br>3. Decision-making | 1. Autonomy<br>2. Clarity of messages<br>3. Friendliness | 1. Commitment<br>Tie, 2 & 3<br>Communication<br>Decision-making | 1. Commitment<br>2. Authority<br>3. Autonomy |

Adapted from Meyer, p. 215

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## APPENDIX A

DATE

FIELD(first name) FIELD(last name)
FIELD(instit name)
FIELD(add1)
FIELD(add2) FIELD(add3)

Dear FIELD(sal) FIELD(last name):

I would like to ask for your cooperation in a project that will take only a few minutes of your time and that may be of great benefit to those of us who are currently involved in workplace literacy programs.

In about a week, I am going to send you a short, two-page survey instrument. This instrument is to be completed by a manager in one of your partner companies (if you are working with more than one company, you may copy the instrument for each one). The purpose of the instrument is to identify factors that are important in a company's readiness to accept workplace literacy training programs. I will include a stamped, self-addressed envelope for your convenience in returning the information to me.

As a follow-up to the instrument, I would like to arrange for a telephone interview with the person(s) who completed the instrument. I anticipate that this should occur early in March. Of course all information will remain anonymous and confidential. The data will be reported in aggregate form. The report of the findings will be sent to you April.

If you have any questions or concerns, please contact me at 304-233-5900, extension 4445 or through my e-mail (ejohnson@nccvax.wvnet.edu).

Sincerely,

Elaine P. Johnson
Curriculum Specialist

EPJ/pp

**APPENDIX A**

January 17, 1996

FIELD(first name) FIELD(last name)
FIELD(instit name)
FIELD(add1)
FIELD(add2)
FIELD(add3)

Dear Colleague:

Enclosed you will find the ***Critical Linkages Survey*** that I wrote you about last week. I hope you will help us gather the data that will allow other workplace literacy projects to benefit from your experience.

Please submit the survey to an appropriate person in your partner company (we trust you to make that decision). If you have more than one partner company, you may make as many copies as you need. Then, return the survey(s) in the stamped, self-addressed envelope that we have provided.

After the data is analyzed, I will ask you to identify one person in your partner company who will agree to a telephone interview that will further explore some of the issues that will have been raised in the survey. Again, if you have any questions or comments, please call me at 304-233-5900, extension 4445 or e-mail me at ejohnson@nccvax.wvnet.edu.

***Thank you so much*** for your invaluable assistance in this project.

Sincerely,

Elaine Johnson
Curriculum Specialist

Enclosures

EPJ/pp

APPENDIX A

# CRITICAL LINKAGES SURVEY

***Thank you for agreeing to be part of a national research project that will help businesses, industries, and educational organizations to identify the factors that impact workplace literacy training.***

What is your job title? 1. _____

Is your company service-oriented (delivers services to customers) or product-oriented (produces a product for use)? 2. _____

Approximately how many persons are employed? 3. (Full-time) _____ (Part-time) _____

Within the next 12 months, do you anticipate 4. adding workers ____ downsizing _____

staying about the same _____

What is the job title of the person who decides workplace training issues? 5. _____

How many supervisory levels exist between the person who makes workplace training decisions and the Chief Executive Officer? 6. _____

Within the last year (1995), have your profits (or level of services provided) 7. gone up _____ gone down _____

stayed about the same _____

When was the first contact you had with the Workplace Literacy program with whom you are currently partnered? (Approx. month and year.) 8. _____

When did the first training take place? (Approx. month and year.) 9. _____

Has your company restructured jobs within the last year (1995)? 10. Yes _____ No _____

Does your company plan to restructure jobs within the next 12 months? 11. Yes _____ No _____

Has your company introduced new technology within the last year (1995)? 12. Yes _____ No _____



*(over, please)*

| | | |
|---|---|---|
| Does your company plan to introduce new technology within the next 12 months? | 13. | Yes _____ No _____ |
| Before your company partnered with the Workplace Literacy Program, did it engage in similar training activities with another organization? | 14. | Yes _____ No _____ |
| If yes, did the company view the results of the program as generally | 15. | Positive ____ Negative ____ Neither ____ |

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***Which <u>three</u> of the following ten statements about work behavior are the <u>most important</u> in your company? (Of the three you choose, please rank their importance (1,2, or 3) with <u>1</u> being the most important.)***

_____ 1. Workers should show consideration for others' needs and feelings.

_____ 2. It is important to plan work tasks and activities in advance.

_____ 3. Workers should communicate information as quickly and appropriately as possible.

_____ 4. Workers should help make decisions and influence company events.

_____ 5. Conflict is best handled by talking it out with the persons involved.

_____ 6. It is important to get along well with others on the job.

_____ 7. Messages should be sent clearly and accurately.

_____ 8. Workers should perform at more than a minimal level.

_____ 9. Workers should be able to work with as much independence and flexibility as possible.

_____ 10. Workers should follow the directives of those immediately above them in decision hierarchy.



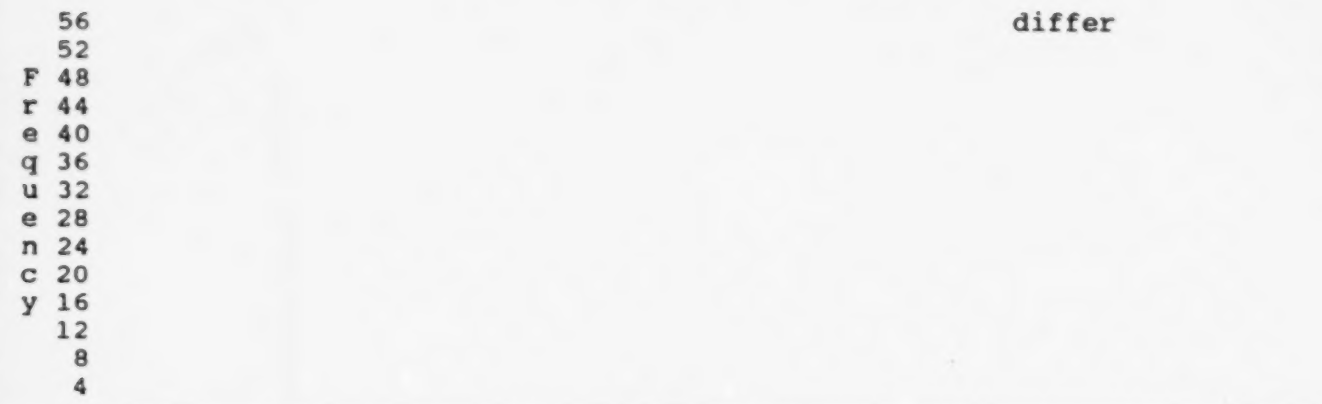
***THANK YOU FOR YOUR HELP!***

STAT-STAR.Freq Dist

Name: TOTAL SAMPLE Date: 4/15/1996 Time: 15:07

Datafile: DIFFEREN.SSO Procedure: Descr Analysis

| | Below 0.000 | 0.000 9.999 | 10.000 19.999 | 20.000 29.999 | 30.000 39.999 | 40.000 49.999 | 50.000 59.999 | 60.000 69.999 | 70.000 79.999 | 80.000 89.999 |
|---|---|---|---|---|---|---|---|---|---|---|
| Freq | 0 | 33 | 10 | 5 | 1 | 0 | 0 | 0 | 0 | 0 |
| Rel F | 0% | 67% | 20% | 10% | 2% | 0% | 0% | 0% | 0% | 0% |




| | 90.000 99.999 | 100.00 109.99 | 110.00 119.99 | 120.00 129.99 | 130.00 139.99 | 140.00 149.99 | 150.00 159.99 | 160.00 169.99 | 170.00 179.99 | Above 179.99 |
|---|---|---|---|---|---|---|---|---|---|---|
| Freq | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rel F | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

STAT-STAR Freq Dist

Name: PRODUCT SAMPLE Date: 4/16/1996 Time: 9:35

Datafile: P-DIFFER.SS0 Procedure: Descr Analysis

| | Below 0.000 | 0.000 9.999 | 10.000 19.999 | 20.000 29.999 | 30.000 39.999 | 40.000 49.999 | 50.000 59.999 | 60.000 69.999 | 70.000 79.999 | 80.000 89.999 |
|---|---|---|---|---|---|---|---|---|---|---|
| Freq | 0 | 20 | 9 | 4 | 1 | 0 | 0 | 0 | 0 | 0 |
| Rel F | 0% | 59% | 26% | 12% | 3% | 0% | 0% | 0% | 0% | 0% |

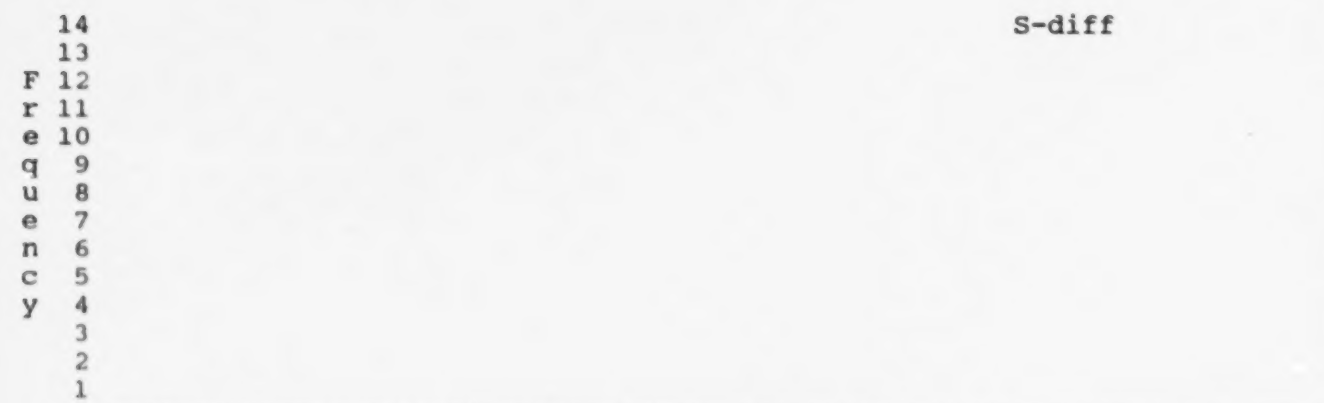
| | 90.000 99.999 | 100.00 109.99 | 110.00 119.99 | 120.00 129.99 | 130.00 139.99 | 140.00 149.99 | 150.00 159.99 | 160.00 169.99 | 170.00 179.99 | Above 179.99 |
|---|---|---|---|---|---|---|---|---|---|---|
| Freq | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rel F | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

STAT-STAR Freq Dist

Name: SERVICE SAMPLE Date: 4/16/1996 Time: 9:40

Datafile: S-DIFFE.SS0 Procedure: Descr Analysis

| | Below 0.000 | 0.000 9.999 | 10.000 19.999 | 20.000 29.999 | 30.000 39.999 | 40.000 49.999 | 50.000 59.999 | 60.000 69.999 | 70.000 79.999 | 80.000 89.999 |
|---|---|---|---|---|---|---|---|---|---|---|
| Freq | 0 | 12 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rel F | 0% | 86% | 7% | 7% | 0% | 0% | 0% | 0% | 0% | 0% |




| | 90.000 99.999 | 100.00 109.99 | 110.00 119.99 | 120.00 129.99 | 130.00 139.99 | 140.00 149.99 | 150.00 159.99 | 160.00 169.99 | 170.00 179.99 | Above 179.99 |
|---|---|---|---|---|---|---|---|---|---|---|
| Freq | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rel F | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

STAT-STAR Data Analysis

Name: PRODUCT/SERVICE DATA DESCRIPTION Date: 4/16/1996 Time: 9:51

Datafile: PS-DIFFE.SS0 Procedure: Descr Analysis

| | P-diff | S-diff | |
|---|---|---|---|
| N: | 33 | 14 | :N |
| M: | 10.758 | 4.643 | :M |
| SD: | 8.224 | 5.601 | :SD |
| estSD: | 8.352 | 5.813 | :estSD |
| AD: | 6.555 | 4.020 | :AD |
| CV: | 76% | 121% | :CV |
| Md: | 9.000 | 2.500 | :Md |
| Q: | 13.000 | 4.000 | :Q |
| R: | 37.000 | 21.000 | :R |
| Min: | 0 | 0 | :Min |
| Max: | 37 | 21 | :Max |
| Sk: | 0.641 | 1.148 | :Sk |
| Mo: | 5 (N=5) | 1 (N=4) | :Mo |

STAT-STAR Data Analysis

Name: PRODUCT/SERVICE ANALYSIS OF VARIANCE Date: 4/16/1996 Time: 9:54

Datafile: PS-DIFFE.SS0 Procedure: One-way ANOVA

DESCRIPTIVE STATISTICS

| Condit | N | Means | St Dev |
|---|---|---|---|
| P-diff | 33 | 10.758 | 8.224 |
| S-diff | 14 | 4.643 | 5.601 |

ANALYSIS OF VARIANCE SOURCE TABLE

| Source | df | Sum of Squares | Mean Square | F | Prob |
|---|---|---|---|---|---|
| Bet Gps | 1 | 367.534 | 367.534 | 6.191 | 0.01661 |
| W/I Gps | 45 | 2671.275 | 59.362 | | |
| Total | 46 | 3038.809 | | | |

Eta sq = 0.121

Mean Contrasts--Tukey's HSD

| | S-diff |
|---|---|
| P-diff | .05 |

STAT-STAR Data Analysis

RAW DATA.

Name: PRODUCT/SERVICE INDEPENDENT MEANS Date: 4/16/1996 Time: 9:57

Datafile: PS-DIFFE.SS0 Procedure: Two Sample |Mean-IndRawD

Null Hypothesis tested: mu1 = mu2 Comparing P-diff & S-diff

| | | | | | |
|---|---|---|---|---|---|
| Sample1: | M = | 10.758 | Sample2: | M = | 4.643 |
| | SD = | 8.224 | | SD = | 5.601 |
| | N = | 33 | | N = | 14 |

(M2 - M1) = -6.115
estSE of (M2 - M1) = 2.457 t = -2.488 p-value = 0.01661
omega^sq = 0.099

Estimated value of (mu2 - mu1):

95% CI = -11.066 to -1.164

STAT-STAR Data Analysis

Name: PRODUCT/SERVICE, INDEPENDENT MEANS Date: 4/16/1996 Time: 9:58

Datafile: PS-DIFFE.SS0 Procedure: Nonparametric |KruskalWallis

Null Hypothesis tested: Populations have same averages

SUM OF RANKS:

P-diff = 911.500
S-diff = 216.500

| | | | | | |
|---|---|---|---|---|---|
| Sample H | = | 7.727 | df = 1.000 | p-value = | 0.00544 |
| H adj. for ties | = | 7.806 | df = 1.000 | p-value = | 0.00521 |

STAT-STAR Data Analysis

Name: PRODUCT/SERVICE INDEPENDENT MEANS Date: 4/16/1996 Time: 10:01

Datafile: PS-DIFFE.SS0 Procedure: Nonparametric |Median

Null Hypothesis tested: P-diff Median = S-diff Median

CONTINGENCY TABLE:

| | P-diff | S-diff | Row Total |
|---|---|---|---|
| Above Median | fo = 18<br>fe = 14.745 | fo = 3<br>fe = 6.255 | 21 |
| At or Below Median | fo = 15<br>fe = 18.255 | fo = 11<br>fe = 7.745 | 26 |
| Col Total = | 33 | 14 | 47 |

Chi Square = 3.125 df = 1 p-value = 0.07712

## Citations

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